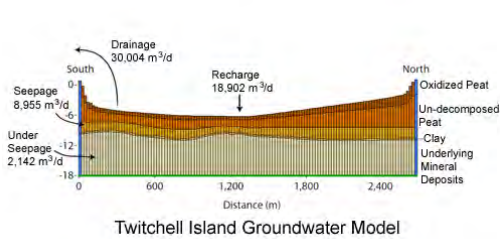


Preliminary Outline for the San Joaquin County and Delta Water Quality Coalition

Groundwater Assessment Report

July 23, 2014



HYDROFOCUS^{UN}

Solutions for Land and Water Resources

July 23, 2014

Mr. Mike Wackman
San Joaquin County Resource Conservation District
3422 W. Hammer Lane
Stockton CA 95219

Dear Mr. Wackman,

We appreciate the opportunity to submit the enclosed draft outline for the Groundwater Assessment Report for the San Joaquin County and Delta Water Quality Coalition as per the Regional Board WDR. The outline reflects and benefits from our efforts during the past year. These include review and documentation of relevant hydrogeologic information, gathering, processing and analysis of groundwater quality and groundwater level data, well and land use information, recharge and pumping estimates from the US Geological Survey Central Valley Hydrologic Model and soils data. We also conducted an initial statistical analysis to delineate vulnerability areas and mapped these areas. Moreover, we presented data and analysis relating to groundwater-surface water relationships in the Sacramento-San Joaquin Delta as it pertains to groundwater quality and future monitoring.

Thank you and please call or email with any questions or concerns.

Sincerely,
HydroFocus, Inc.



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San Joaquin County and Delta Water Quality Coalition
Groundwater Quality Assessment Report
Draft Outline, July 23, 2014

1. Introduction

a. Report background

i. San Joaquin County and Delta Water Quality Coalition Area

1. Geographic extent and features
2. Description of agricultural activities

ii. Waste Discharge Requirement (WDR)

1. Board action
2. Nitrate concern

iii. Groundwater Quality Assessment Report (GAR)

1. Purpose and scope
2. Delineation of phases

- a. Non-Delta groundwater conditions
- b. Delta groundwater conditions

3. Report overview

- a. Data gathering and processing
- b. Data analysis
 - i. Geochemical and statistical analysis
 - ii. Analysis of Delta subsurface conditions
 - iii. Hydrologic and geochemical analysis of Delta groundwater/surface water interactions
 - iv. Assessment of concentration trends
- c. Delineation of vulnerability areas relative to hydrogeologic and geographic features
- d. Monitoring options
- e. Conclusions

b. Hydrologic context

i. Non-Delta

1. Hydrogeologic setting

- a. Groundwater sub-basins
 - i. Cosumnes
 - ii. Eastern San Joaquin
 - iii. Tracy
- b. Water-bearing formations

- i. Alluvium and Modesto/Riverbank, Laguna and Mehrten and flood basin deposits and primary water-bearing formations.
- 2. Groundwater sources
 - a. Precipitation
 - b. Agricultural irrigation and urban return flows
 - c. Reservoirs
 - d. River seepage
- 3. Groundwater level trends
 - a. Non-Delta areas: data from San Joaquin County, California Department of Water Resources (DWR), United States Geological Survey (USGS)
 - b. Delta area: data from Delta Wetlands Project, HydroFocus data, Jones Tract monitoring, USGS, consultants
- 4. Groundwater quality issues determined from data reviewed
 - a. Primary constituent of concern related to agriculture:
 - i. Nitrate
 - b. Other constituents of concern related to agriculture to be considered:
 - i. Salinity
 - ii. Pesticides
 - 1. DBCP
 - 2. Simazine
 - 3. Atrazine
 - c. Constituents not directly affected by agriculture
 - i. Trace elements
 - 1. Boron
 - 2. Arsenic
 - ii. Chlorinated hydrocarbons not associated with agricultural activities
- ii. Sacramento-San Joaquin Delta hydrology, geology and land- and water-management
 - 1. Delta organic soils
 - a. History of cultivation and subsidence
 - b. Formation processes
 - c. Description of spatial variability of organic-soil thickness
 - 2. Current conceptual model for Delta island groundwater-surface water interactions: published Twitchell Island case study

- a. San Joaquin River seepage and island drain flow
 - b. Findings from groundwater flow and solute transport models and groundwater budget
 - 3. Key Delta groundwater quality issues related to agriculture.
 - a. Dissolved organic carbon (DOC)
 - i. Disinfection byproducts
 - ii. Unsaturated zone accumulation and mobilization from organic soils to drainage ditches
 - b. Salts
 - c. Monitoring and groundwater High Vulnerability Areas (HVAs)
 - i. California Department of Pesticide Regulation (DPR): Ground Water Protection Program
 - 1. Program overview
 - 2. Description of Groundwater Protection Areas (GWPA's)
 - ii. State Water Resources Control Board: Hydrogeologically Vulnerable Areas
 - iii. Northeast San Joaquin County Groundwater Banking Authority: Eastern San Joaquin Groundwater Basin Groundwater Management Plan
 - iv. Existing groundwater quality data collection efforts
 - 1. DPR pesticide monitoring
 - 2. California Department of Public Health (CDPH) water supply quality monitoring
 - 3. San Joaquin County Flood Control and Water Conservation District monitoring
 - a. Water levels
 - b. Chloride
 - c. Electrical conductivity
 - d. Total dissolved solids
 - 4. USGS water quality monitoring
 - 5. DWR water level monitoring
2. Data and Methods
 - a. General data structure
 - i. Access database
 - 1. Structure
 - 2. Data contained
 - ii. Geographic Information Systems (GIS)
 - 1. Base map layers
 - 2. Geo-referenced data from Access database

- 3. Geo-referenced geographic features
- b. Data for non-Delta areas
 - i. Groundwater hydrologic and chemical data
 - 1. Groundwater Ambient Monitoring and Assessment Program (GAMA)
 - 2. DPR
 - 3. Dairy Cares Representative Monitoring Program
 - 4. San Joaquin County Public Works
 - 5. DWR
 - 6. USGS
 - ii. Land use
 - 1. DWR
 - 2. United States Department of Agriculture (USDA)
 - 3. Department of Conservation Farmland Mapping
 - iii. Soils
 - 1. Source: USDA Natural Resource Conservation Service (NRCS)
 - 2. Particular interests:
 - a. Sand percentage in non-Delta soils
 - b. Organic matter content in Delta soils
 - iv. Subsurface geology and well information
 - 1. DWR well logs
 - a. Lithology
 - b. Well screened depth intervals
 - c. Well depths
 - 2. USGS Central Valley Hydrologic Model (CVHM) texture model
 - 3. Municipal supply well information
 - v. Net groundwater recharge (CVHM)
- c. Methods for non-Delta areas
 - i. Geographical Information Systems (GIS)
 - 1. Well locations
 - 2. Assignment of land-use to wells for the database and statistical analysis
 - 3. Geospatial calculation of statistical model
 - 4. Delineation and prioritization of vulnerability areas
 - ii. Extraction of groundwater flow model data (CVHM)
 - 1. Net recharge
 - 2. Texture model
 - iii. Geochemical and statistical analysis of data in non-Delta areas

1. Major ion composition
2. Cation-anion balance
 - a. Calculation method
 - b. Classification of samples by ion imbalance
3. Boxplots: nitrate concentration by land use
4. Multiple linear regression: predictors of nitrate concentration
5. Non-parametric statistical tests
 - a. Purpose: evaluating difference in groundwater nitrate concentrations among land uses
 - b. Kruskal-Wallis
 - c. Mann-Whitney
- d. Data and methods for Delta areas
 - i. Lithology and land-surface and bottom of peat elevations
 1. DWR Light Detection and Ranging (LiDAR)
 2. Peat bottom elevations
 - a. DWR well logs
 - b. Atwater study
 - c. Well completion reports and borehole logs from other sources
 3. Interpolation of Delta-wide peat bottom elevation grid using Geostatistical Analyst (GIS)
 - a. Tools
 - i. Semivariogram
 - ii. Kriging
 - b. Findings
 - i. Determination of anisotropy
 - ii. Peat thickness across east-west axis
 - ii. Groundwater levels
 1. Harding Lawson Associates: Delta Wetlands Project
 - a. Digitization of hydrographs
 - b. Calculation of average groundwater elevations by well
 2. Hultgren-Tillis Geotechnical Engineers: Upper Jones Tract flood monitoring
 3. HydroFocus groundwater monitoring data
 - a. Dutch Slough
 - b. Twitchell Island
 - c. Jersey Island
 4. USGS: Medford Island data

- 5. Water Associates Group: Roberts Island data
 - iii. Channel stage
 - 1. DWR
 - 2. USGS
 - 3. Calculation of daily averages and average daily highs
 - iv. Groundwater and surface-water isotopic data for assessment of groundwater-surface water interactions
 - 1. Stable isotopes of water
- 3. Results
 - a. Non-Delta area
 - i. Water quality
 - 1. Maps displaying temporal and spatial groundwater nitrate distribution
 - a. Temporal variations in sample quantities
 - b. Agricultural areas with recent (2009 -2013) nitrate above MCL
 - i. Comparison with DPR GWPA's
 - ii. Comparison with State Water Board Hydrologically Vulnerability Areas
 - 2. Trilinear diagrams showing relation of major-ion chemistry and nitrate concentrations
 - a. Diagram explanation
 - b. Groups from Izbicki et al. study
 - c. HydroFocus data plots using Izbicki group delineations
 - 3. Nitrate concentrations and well depths
 - 4. Nitrate correlations with other constituents other constituents
 - a. Salinity
 - b. Electrical conductivity
 - c. Hardness
 - d. Total dissolved solids
 - e. Calcium
 - f. Magnesium
 - g. Sodium
 - h. Chloride
 - i. Sulfate
 - j. Pesticides
 - ii. Relevant spatially distributed data
 - 1. Depth to groundwater

- a. General description
 - b. Relationship of groundwater depth with nitrate concentrations
- 2. Land use and management practices
 - a. General description
 - b. Comparison of DWR (1996) and USDA (2012)
 - c. Nitrogen fertilizer application rates
 - d. Available information on irrigation practices
 - e. Well occurrences by land use and location within the Service Area
 - f. Statistical relationship of land use with groundwater nitrate concentrations
- 3. Soils
 - a. General description
 - i. Non-Delta
 - 1. Texture classifications
 - a. Sandy soils
 - b. Loamy soils
 - c. Clayey soils
 - 2. Textures in various Service Area locations
 - ii. Delta
 - 1. Highly organic mineral soils
 - 2. Less decomposed organic soils
 - b. Relationship of soils with groundwater nitrate concentrations
- 4. Subsurface texture
 - a. Coarse grain percentage variability with depth and geography
 - b. Relationship of subsurface textures with groundwater nitrate concentrations
- 5. Net groundwater recharge
 - a. General range across the Service Area
 - b. Relationship of net recharge rates with groundwater nitrate concentrations
- iii. Regression and covariance analysis and preliminary delineation of HVAs
 - 1. Variables examined as predictors of nitrate
 - 2. Resulting regression model

3. Model performance at explaining variance in nitrate concentrations
 4. Assessment of the model with respect to nitrate data in various Service Area regions
 5. Comparison of regression-derived HVAs with DPR Groundwater Protection Areas
 6. Additional HVA considerations
 - a. Prevalent land uses in the HVAs
 - b. Proximity to drinking water supply recharge sources
 - c. Proximity to basins under review by CV-SALTS
- b. Delta
- i. Land-surface elevations at various locations in the Service Area
 - ii. Groundwater levels
 1. Assessment of trends from hydrographs
 - a. Water level stability in recent decades
 - b. Basis for regional comparison and delineation of artesian areas for conceptual model
 2. Artesian areas
 - a. Area encompassing artesian wells
 - b. Criteria for delineation: groundwater elevation exceeding the top of the confined aquifer
 - c. Physical explanation
 - i. General Delta subsurface lithology
 1. Shallow peat deposits
 2. Tidal muds
 3. Coarse underlying material
 - ii. Artesian areas related to groundwater elevation and land surface elevation
 - iii. Geohydrologic basis for artesian areas
 - d. Examples
 - i. Jersey Island
 - ii. Twitchell Island
 - iii. Isotopes in groundwater and surface-water samples
 1. Delta river channels as the source of groundwater
 - a. Twitchell Island
 - b. Confirmation from other islands
 2. Relationship between depth and degree of evaporation

- a. Conclusion: Delta channel water is the source for Delta groundwater

4. Discussion

- a. Overview of GAR objectives

- i. HydroFocus objectives

- 1. To develop a preliminary delineation of areas of high and low vulnerability to exceedance of the MCL for groundwater nitrate concentrations
 - 2. To assess groundwater-surface water interactions in the Sacramento-San Joaquin Delta for determination of need of groundwater monitoring.

- ii. GAR objective defined in the WDR: To provide an assessment of all readily available, applicable, and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation

- 1. Specification of data and information to be reviewed
 - 2. Demonstration that this objective has been met

- iii. Future uses of the GAR

- 1. Establishing priorities for implementation of monitoring and studies within high vulnerability or data gap areas
 - 2. Assessing groundwater quality trends
 - 3. Evaluating the effectiveness of agricultural management practices to protect groundwater quality
 - 4. Establishing groundwater quality management plans

- b. Nitrate concentrations in non-Delta areas

- i. Occurrence of high nitrate related to time and well depth

- 1. Increasing high concentrations since 1970
 - 2. Exceedances associated with shallow wells and shallow groundwater
 - 3. Reasons why well depth and construction may affect nitrate
 - a. Canter study
 - b. Barbash and Resek study

- ii. Variables identified as nitrate predictors in the regression model

- 1. Depth to groundwater
 - 2. Net recharge
 - 3. Percent sand in soils

- c. Delineation of HVAs

- i. Review of WDR language regarding HVA determination

1. Process for determination
2. Definition: known groundwater quality impacts exist for which
 - a. Irrigated agricultural operations are a potential contributor; or
 - b. Conditions make groundwater more vulnerable to impacts from irrigated agricultural activities
- ii. Assessment of HVAs derived from the regression model and additional considerations
 1. Entire nitrate dataset will be used for the regression model.
 2. Comparison between regression model results and nitrate concentrations
 3. Comparison between regression model results and DPR GWPAs
 4. Proximity of vulnerability areas to municipal and domestic water supplies.
 5. Independent variables for explaining nitrate concentrations
 - a. Depth to groundwater
 - b. Net recharge
 - c. Soil texture
 6. Prioritization of HVAs based on model-predicted groundwater nitrate concentrations.
 7. Predominant commodity types (comprising at least 80%) of irrigated land within HVAs
- d. Monitoring options for non-Delta areas
 - i. Discussion of existing groundwater quality data collection efforts
 - ii. Future prospects for data and sampling
- e. Delta groundwater-surface water interactions and water quality
 - i. Deverel and others Delta groundwater-surface water conceptual model.
Evidence includes:
 1. Subsurface lithology
 2. Groundwater level data and delineation of artesian areas
 3. Calculated depths of drainage ditch capture
 4. Water isotope data
 - ii. Evidence demonstrates lack of downward movement of contaminants to drinking water wells and points to drain-water monitoring as likely alternative.
 - iii. Central Valley Regional Board in allowing monitoring of drain water in lieu of shallow groundwater on Jersey Island
 - iv. Description of the conceptual model

1. Groundwater on Delta islands where land surface is below surface water elevation flows to networks of drainage ditches from a substantial depth below the bottom of the drainage ditch
 2. Chemical composition of drainage water varies seasonally and with management practices
 3. During irrigation events, drainage ditches receive irrigation runoff
 4. Island main drains serve as temporal-spatial integrators of processes that occur within the island drainage network
 - v. Implications of conceptual model: drain monitoring in lieu of well monitoring.
5. Summary, Conclusions
- a. Non-Delta
 - i. Summary of methods
 - ii. Summary of the relationships between high nitrate and various factors
 1. Time
 2. Depth to water
 3. Well depth
 4. Net recharge
 5. Subsurface texture
 - iii. Summary assessment of proposed HVAs
 1. Compared with high nitrate concentrations
 2. Compared with DPR GWPs
 - b. Delta
 - i. Summary of methods
 - ii. Summary of the conceptual model
 1. Evidences
 - a. Isotopic
 - b. Lithologic and hydrologic
 2. Description
 - a. Groundwater is derived from adjacent channels
 - b. Shallow groundwater is subject to evaporation
 - c. Drainage ditches collect partially evaporated and non-evaporated groundwater
 - d. Drainage-water quality varies seasonally
 3. Delineation of artesian groundwater
 - a. North Delta areas included
 - i. Tyler Island
 - ii. Staten Island

- b. East Delta areas mostly included
 - i. New Hope Tract
 - ii. Canal Ranch
 - iii. Brack Tract
 - iv. Terminous Tract
 - v. Shinkee Tract
 - vi. Rio Blanco Tract
 - vii. Bishop Tract
 - viii. Shima Tract
 - ix. Wright-Elmwood Tract
- c. South Delta areas mostly included
 - i. Fabian Tract
 - ii. Union Island
 - iii. Roberts Island
- d. Areas transected by the western boundary
 - i. Hotchkiss Tract
 - ii. Veale Tract
 - iii. Byron Tract

Preliminary List of Potential Data Sources

<i>Data Type</i>	<i>Database Source</i>	<i>Source Location or Description</i>
Hydrogeological Background	Published hydrogeology literature	Various publications
Groundwater Level	San Joaquin County	Database provided by County Public Works personnel
	SWRCB Groundwater Ambient Monitoring and Assessment Program (GAMA)	Data files provided by DWR personnel via Francisca Johnson of MLJ-LLC
	DWR California Statewide Groundwater Elevation Monitoring (CASGEM)	http://www.water.ca.gov/groundwater/casgem/
	USGS National Water Information System (NWIS)	http://waterdata.usgs.gov/nwis
	Delta Wetlands Project	Harding Lawson Associates (1991)
	Upper Jones Tract Groundwater Monitoring	Hultgren-Tillis Geotechnical Engineers (1995)
	HydroFocus Dutch Slough Monitoring	HydroFocus, Inc. (2013)
Groundwater Quality	San Joaquin County	Database provided by County Public Works personnel
	SWRCB Groundwater Ambient Monitoring and Assessment Program (GAMA)	http://www.waterboards.ca.gov/gama/
	Department of Pesticide Regulation	Data provided by DPR personnel
	USGS National Water Information System (NWIS)	http://waterdata.usgs.gov/nwis
	Dairy Cares Representative Monitoring Program	Data provided by Luhdorff & Scalmanini personnel
Land Use	DWR Land Use Survey	http://www.water.ca.gov/landwateruse/lusrvymain.cfm
	USDA Natural Agricultural Statistics Service (NASS)	http://nassgeodata.gmu.edu/CropScape/
	Department of Conservation Farmland Mapping and Monitoring Program (FMMP)	http://www.conservation.ca.gov/dlrp/fmmp/Pages/Index.aspx
Fertilizer Application	Published agronomy literature	Various publications

<i>Data Type</i>	<i>Database Source</i>	<i>Source Location or Description</i>
Rates		
Soils	USDA Natural Resource Conservation Service (NRCS)	http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx
Groundwater Recharge	USGS Central Valley Hydrologic Model (CVHM)	http://ca.water.usgs.gov/projects/central-valley/central-valley-hydrologic-model.html
Drinking Water System Boundaries	DPH Environmental Health Tracking Program Water Boundary Dataset	http://www.ehib.org/page.jsp?page_key=762
Non-Delta Subsurface Geology and Wells	DWR Well Logs	Provided upon application by DWR personnel
	USGS Central Valley Hydrologic Model (CVHM)	http://ca.water.usgs.gov/projects/central-valley/central-valley-hydrologic-model.html
	Screened intervals for municipal supply wells	Data provided by Public Works personnel from the cities of Lodi, Lathrop, and Ripon
Delta Lithology, Elevation, and Peat Bottom	Published lithological studies	Various publications
	DWR Light Detection and Ranging (LiDAR) Elevation Dataset	ftp://atlas.ca.gov/pub/delta-vision/lidar2009/
	Atwater peat bottom data	Atwater (1982): USGS Miscellaneous Field Studies Map MF-1401
Delta Channel Stage	DWR California Data Exchange Center (CDEC)	http://cdec.water.ca.gov/
	DWR Water Data Library	http://www.water.ca.gov/waterdatalibrary/
Delta Water Isotopes	HydroFocus, Inc.	Various publications

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Cross-Reference Table between GAR Outline and WDR General Order R5-2014-0029

GAR Items Identified in Monitoring and Reporting Program (Appendix B) of the San Joaquin County and Delta WDR General Order	Addressed in GAR Outline
1. Objectives	
a. Provide an assessment of all readily available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation.	Throughout
b. Establish priorities for implementation of monitoring and studies within high vulnerability or data gap areas.	Section 4 (Discussion)
c. Provide a basis for establishing monitoring workplans developed to assess groundwater quality trends.	Throughout
d. Provide a basis for establishing management practices evaluation program workplans and priorities developed to evaluate the effectiveness of agricultural management practices to protect groundwater quality.	Throughout
e. Provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.	Throughout
2. Components	
a. Detailed land use information with emphasis on land uses associated with irrigated agricultural operations. The information shall identify the largest acreage commodity types in the third-party area, including the most prevalent commodities comprising up to at least 80% of the irrigated agricultural acreage in the third-party area.	Section 3 (Results)
b. Information regarding depth to groundwater, provided as a contour map(s), if readily available. Tabulated and/or graphical data from discrete sampling events may be submitted if limited data precludes producing a contour map.	Section 3 (Results)
c. Groundwater recharge information, if readily available, including identification of areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply.	Section 3 (Results)
d. Soil survey information, including significant areas of high salinity, alkalinity and acidity.	Section 3 (Results)
e. Shallow groundwater constituent concentrations from existing monitoring networks (potential constituents of concern include any material applied as part of the agricultural operation, including constituents in irrigation supply water [e.g., pesticides, fertilizers, soil amendments, etc.] that could impact beneficial uses or cause degradation).	Section 3 (Results)
f. Information on existing groundwater data collection and analysis efforts relevant to this Order (e.g., Department of Pesticide Regulation [DPR] United States Geological Survey [USGS] State Water Board Groundwater Ambient Monitoring and Assessment [GAMA], California Department of Public Health, local groundwater management plans, etc.). This groundwater data compilation and review shall include readily accessible information relevant to the Order on existing monitoring well networks, individual well details, and monitored parameters. For existing monitoring networks (or portions thereof) and/or relevant data sets, the third-party should assess the possibility of data sharing between the data-collecting entity, the third-party, and the Central Valley Water Board.	Section 2 (Data and Methods); Section 3 (Results); Section 4 (Discussion)
3. Data Review and Analysis	
a. Determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities.	Section 1 (Introduction); Section 3 (Results); Section 4 (Discussion)
b. Determine the merit and feasibility of incorporating existing groundwater data collection efforts, and their corresponding monitoring well systems for obtaining appropriate groundwater quality information to achieve the objectives of and support groundwater monitoring activities under this Order. This shall include specific findings and conclusions and provide the rationale for conclusions.	Section 4 (Discussion)
c. Prepare a ranking of high vulnerability areas to provide a basis for prioritization of workplan activities.	Section 4 (Discussion)
d. Describe pertinent geologic and hydrogeologic information for the third-party area(s) and utilize GIS mapping applications, graphics, and tables, as appropriate, in order to clearly convey pertinent data, support data analysis, and show results.	Throughout
4. Groundwater Vulnerability Designations	
a. Designate high/low vulnerability areas for groundwater in consideration of high and low vulnerability definitions provided in Attachment E of the Order.	Section 4 (Discussion)
b. The vulnerability designations will be made by the third-party using a combination of physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (e.g. irrigation method, crop type, nitrogen application and removal rates, extent of implementation, etc.).	Section 4 (Discussion)
c. The third-party shall provide the rationale for proposed vulnerability determinations.	Section 4 (Discussion)
5. Considerations for Prioritization of High Vulnerability Groundwater Areas	
a. Identified exceedances of water quality objectives for which irrigated agriculture waste discharges are the cause, or a contributing source.	Section 3 (Results); Section 4 (Discussion)
b. The proximity of the high vulnerability area to areas contributing recharge to municipal and domestic supplies where groundwater serves as a significant source of supply.	Section 3 (Results)
c. General consideration of existing field or operational practices identified to be associated with irrigated agriculture waste discharges that are the cause, or a contributing source.	Section 3 (Results)
d. The largest acreage commodity types comprising up to at least 80% of the irrigated agricultural acreage in the high vulnerability areas and the irrigation and fertilization practices employed by these commodities.	Section 4 (Discussion)
e. Legacy or ambient conditions of the groundwater.	Section 3 (Results)
f. Groundwater basins currently or proposed to be under review by CV-SALTS.	Section 3 (Results)
g. Consideration of constituents of concern besides nitrogen, e.g., relative toxicity (as compared to other constituents of concern), mobility.	Section 3 (Results)